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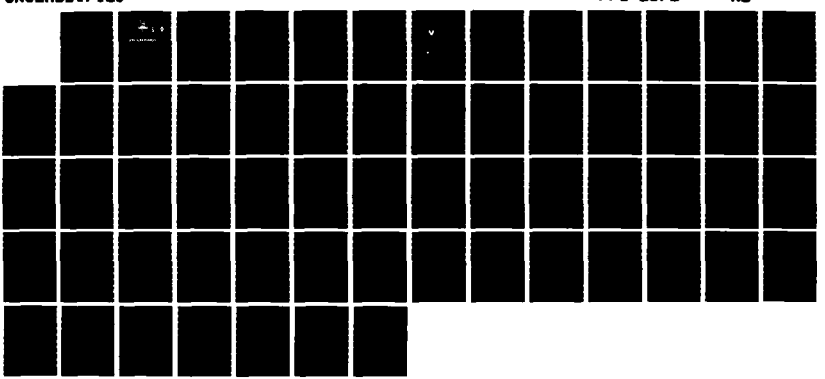

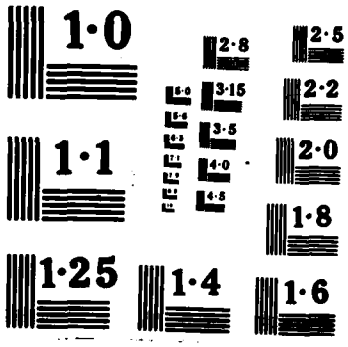
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PROCEEDINGS

SECOND DEMILITARIZATION AND DISPOSAL TECHNOLOGY CONFERENCE

APRIL 24-25-26, 1979

THE HILTON INN OF SALT LAKE

Salt Lake City, Utah

AMERICAN DEFENSE PREPAREDNESS ASSOCIATION
NATIONAL HEADQUARTERS: Union Trust Building, Washington, D.C. 20005

PAPERS PRESENTED

at the

SECOND DEMILITARIZATION AND DISPOSAL TECHNOLOGY CONFERENCE

Sponsored by

CHEMICAL SYSTEMS DIVISION

AMERICAN DEFENSE PREPAREDNESS ASSOCIATION

Salt Lake City, Utah

24-26 April 1979

Compiled by

JOHN A. BROWN

Chairman, Chemical Systems Division

Partial

CONTENTS:

FOREWORD

This volume contains four-page summaries of most of the formal papers that were presented at the Second Demilitarization and Disposal Technology Conference, held 24-26 April 1979 in Salt Lake City. All speakers were invited to submit summaries for inclusion; some did, and some did not.

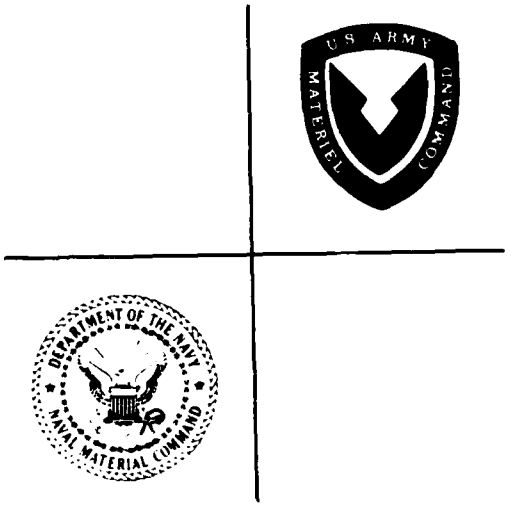
You are encouraged to contact any author for more information and/or discussion. We have included the authors' mailing addresses and telephone numbers where we knew them.

The initiative and guidance of Mr. Edward J. Jordan, Executive Director, JCAP, in proposing and helping to organize the Conference is gratefully acknowledged.

Your comments and suggestions as to future meetings are solicited. Please send them to LtC. R. F. Rose, American Defense Preparedness Association, 740 15th Street NW, Washington, DC 20005.

JOHN A. BROWN
Conference Chairman

SECOND DEMILITARIZATION AND DISPOSAL TECHNOLOGY CONFERENCE



AMERICAN DEFENSE PREPAREDNESS ASSOCIATION

Chemical Systems Division
Environmental Systems Section

APRIL 24-25-26, 1979

THE HILTON INN OF SALT LAKE
Salt Lake City, Utah

SECOND DEMILITARIZATION AND DISPOSAL TECHNOLOGY CONFERENCE

Salt Lake City, Utah 24-26 April 1979

AGENDA

MONDAY, 23 APRIL

1800 EARLY REGISTRATION—Lobby, Hilton Inn of Salt Lake

TUESDAY, 24 APRIL

0700 LATE REGISTRATION—Lobby, Hilton Inn of Salt Lake

0800 CONFERENCE ADMINISTRATIVE ANNOUNCEMENTS

0815 KEYNOTE ADDRESS—DOD SINGLE MANAGER FOR CONVENTIONAL AMMUNITION — NEW CHALLENGES AND NEW PERSPECTIVES IN DOD CONVENTIONAL AMMUITION MANAGEMENT—MG William E. Eicher, Commander, USA Armament Materiel Readiness Command

SESSION I
EPA Regulations and Their Impact on Demilitarization and Disposal

0845 SESSION CHAIRMAN—Mr. Edward J. Jordan, Executive Director, Joint Conventional Ammunition Program Coordinating Group

0900 NEW EPA HAZARDOUS AND SOLID WASTE DISPOSAL REGULATION STANDARDS, GUIDELINES, AND TIMETABLE—Mr. John P. Lehman, Director, Hazardous Waste Management Division, U.S. Environmental Protection Agency

1000 BREAK

1030 DOD EVALUATION AND IMPACT ASSESSMENT OF NEW EPA HAZARDOUS AND SOLID WASTE DISPOSAL REGULATIONS—Mr. John L. Byrd, Chairman, JCAP Demilitarization and Disposal Task Group and Director, Defense Ammunition Center

1100 EPA-DOD PANEL RESPONSE TO CONFERENCE PARTICIPANTS—Mr. John Lehman, EPA; Mr. John L. Byrd, JCAP Coordinating Group; and Mr. Thomas Hess, USA Environmental Hygiene Agency

1130 LUNCH

SESSION II
Organizing for Demilitarization

SESSION CHAIRMAN—Mr. Thomas Wash, Chief, Environmental Quality Office, USA Armament, Materiel Readiness Command.

1300 DOD DEMILITARIZATION AND DISPOSAL ORGANIZATION—Mr. Peter Sinclair, Ammunition Advisor, Defense Ammunition Center

1330 PLAN FOR DOD SINGLE MANAGER DEMILITARIZATION FACILITIES—Mr. John L. Byrd, Director, Defense Ammunition Center

1400 MANAGING A LOGISTICS COMMAND ENVIRONMENTAL PROGRAM—Mr. James E. Tragesser, Environmental Quality Office, USA Materiel Development and Readiness Command

1430 THE NAVAL ENVIRONMENTAL PROTECTION SUPPORT SERVICE EFFORTS IN HAZARDOUS WASTE DISPOSAL—Mr. Karl E. Kneeling, Navy Environmental Support Office

1500 BREAK

1530 POLLUTION MONITORING OF DEMILITARIZATION PROCESSES—Mr. Daniel Burch, Chemist, Weapons Engineering Center, Naval Weapons Support Center, Crane, IN

1600 DESIGN/REDESIGN OF AMMUNITION TO FACILITATE DEMILITARIZATION—Dr. James Cornette, Environmental Control Office (USAF), Armament Development and Test Center; Mr. Samuel Davelman, Demilitarization Coordinator, USA Armament Materiel Readiness Command Support Group; and Ms. Ann Thompson, Assistant Demilitarization Program Manager, Naval Sea Systems Command

1645 FREE TIME

1830 RECEPTION/SOCIAL

WEDNESDAY, 25 APRIL

0800 ANNOUNCEMENTS

SESSION III
Demilitarization Technology

SESSION CHAIRMAN—COL John P. Piercy, Director of Occupation and Environmental Health, USA Environmental Hygiene Agency

0815 DEMILITARIZATION PROCESSES AND EQUIPMENT—Mr. Frank Crist, Chief, Ammunition Engineering Office, Tooele Army Depot

0845 MEDICAL EFFECTS OF HAZARDOUS WASTE DISPOSAL—LTC J. W. Thiessen, MC, USA Environmental Hygiene Agency

0915 CHEMICAL DEMILITARIZATION AND INSTALLATION RESTORATION—COL Frank Jones, Commander, USA Toxic and Hazardous Materials Agency

0945 CHEMICAL, NON-TOXIC DISPOSAL SYSTEM—Mr. Thomas Shook, Chief, Development and Technical Division, Pine Bluff Arsenal

1015 BREAK

1045 DESIGN AND IMPLEMENTATION OF MONITORING PROGRAMS DURING DEMILITARIZATION—Dr. Anthony P. Graffeo, Battelle Memorial Institute

1115 ENERGY ASPECTS OF DEMILITARIZATION AND DISPOSAL—Mr. John L. Byrd, Director, Defense Ammunition Center

1145 DEMILITARIZATION AND DISPOSAL TECHNOLOGY ANALYSIS AND EVALUATION—Dr. James Cornette, Environmental Coordinator (USAF), Armament Development and Test Center

1215 FREE TIME OR TOOELE BUS TOUR (Box lunch on bus)

1600 DEMILITARIZATION FURNACE TECHNOLOGY—Mr. Frank Rinker, Surface Combustion Division, Midland-Ross Corp.

1630 USING THE CAVIJET TO REMOVE EXPLOSIVES FROM ARMY MUNITIONS—Dr. Andrew F. Conn, Head, Material Sciences Division, Hydronautics, Incorporated

1700 SAWING LARGE DIAMETER PROPELLANT GRAINS—Mr. Wallace Silver, Naval Weapons Center, China Lake

1730 ADJOURN—Free Evening

THURSDAY, 26 APRIL

0800 ANNOUNCEMENTS

SESSION IV
Recovery, Reuse, and Resale

SESSION CHAIRMAN—Mr. Kenneth Range, Demilitarization Program Manager, Naval Sea Systems Command

0815 NAVY PROGRAM FOR SALE OF SURPLUS PEP AND MUNITIONS—Mr. Kenneth Range, Demilitarization Program Manager

0845 DOD SURPLUS PROPERTY DISPOSAL PROGRAM—Mr. Paul Prutzman, Property Disposal Specialist, Defense Logistics Agency

0915 REUSE OF RECLAIMED NAVAL EXPLOSIVES—Dr. Louis Rothstein, Naval Weapons Station, Yorktown

0945 INDUSTRY USE OF SURPLUS PEP—TBA

1015 BREAK

1045 PANEL DISCUSSION ON REUSE AND SALE—Mr. Kenneth Range, NAVSEA; Mr. Lawrence Kueter, SMCA; and Dr. Louis Rothstein, Yorktown

SECOND DEMILITARIZATION & DISPOSAL TECHNOLOGY CONFERENCE

KEYNOTE ADDRESS

BY

MAJOR GENERAL WILLIAM E. EICHER, USA

COMMANDER, USA ARMAMENT MATERIEL READINESS COMMAND

24 April 1979

INTRODUCTION

It is a genuine pleasure to keynote this conference which is addressing an important and a rapidly developing area of major concern to industry and to government.

This is not a glamorous area. The glamor is in weapons---especially new weapons---the more exotic---the more glamorous. Demilitarization is what happens when the glamor wears off. But that must not deter us in getting our job done.

Some people *think*---and act as though---ammunition belongs to a secret handshake society. Well let me tell you they are wrong. And let me tell you here from industry we want you involved. We need your ideas and we need your technology to tackle the problems that will be presented at this conference. To reinforce my view I will write GEN Miley, the head of the American Defense Preparedness Association, and ask his help in spreading the word and getting greater emphasis on demil in the ADPA Program. To those of you here from industry I want to hear from you if you have some practical cost effective proposals to solve our problems.

We are on the threshold of new and more stringent environmental standards and guidelines that will not permit any of us to continue to do business as usual.

As the Chief Executive Officer of a Defense organization whose operations are directly affected, I am keenly aware of the economic and operational implications of not only new and more stringent EPA regulations, but occupational safety and health and security requirements as well. We are being challenged to comply at the national -- state -- and local levels.

The current price tag for compliance of my Command is over a billion dollars. In order to intensively manage my compliance effort I have established an Environmental Control Center to give me continuous updates on new requirements, planning and execution of environmental compliance programs and projects, and challenges, litigation, and waivers.

In FY80 I plan to initiate meetings between my Command and the EPA Regions in which I operate. The object of these meetings will be to improve communications with EPA and achieve a more positive tone in our relationship.

THE SINGLE MANAGER FOR CONVENTIONAL AMMUNITION MISSION

Before I get into the Single Manager wholesale demilitarization and disposal operation, let me briefly outline the background, concept, and range of the total SMCA mission.

The idea of establishing a centralized DOD manager for Conventional Ammunition is not new. It came up at the end of WWII and again at the end of the Korean emergency -- it became a reality at the end of the war in Southeast Asia. You ask why it became a reality at that time. The answer is that ammunition became the biggest single commodity in that war -- in terms of criticality in combat operations -- in terms of enormous tonnages produced and moved through the distribution system -- and in terms of defense dollars. Ammunition was literally intensively managed by the Secretary of Defense himself -- and at every level down through and including the combat operations level.

The Army was selected to perform the Single Manager mission because it had the biggest ammunition mission. That is the reason why my Command was assigned to the execution of the Single Manager mission which, broadly speaking, makes us the defense wholesaler.

The Military Services conduct market research (establish Military requirements), conduct R&D, and initial acquisition of their products. When the products are accepted by the Services, we pick up with the full-scale procurement, production, supply, maintenance, and ultimately, at the end of the stream, demil and dispose of unserviceable, obsolete, and excess stocks. Wholesale stocks represent 10,000 products valued at $9 billion -- we are procuring and producing at a level of $1.4 billion per year. 87% of our acquisition program goes to industry producers -- 3% to government producers -- 10% to quality assurance, engineering in support of production, transportation. This is a good sized operation.

We are into the operation less than two years. We have made a lot of progress -- we still have a long way to go. Anyone who has ever been involved in a corporate reorganization understands that it takes time to shake down -- we are well into it.

ARRCOM DEMILITARIZATION ROLES

As my introduction indicated, I have three roles in demilitarization and disposal.

First, I am Materiel Readiness Manager for Army Weapons Systems and Ammunition which do not come under the Single Manager for Conventional Ammunition Mission. That includes demilitarization and disposal of Army weapons --- and ammunition not under the Single Manager Charter.

Second, I am the Department of Defense wholesale Demilitarization and Disposal Manager for Conventional Ammunition consigned to the Single Manager for Conventional Ammunition by all Military Services for demilitarization and disposal.

Third, I am Chairman of the Joint Conventional Ammunition Program Coordinating Group -- or JCAP as it is known. This group includes the flag and general officers of the Military Services Ammunition organizations. We coordinate ammunition programs and activities, whether they are under the Single Manager Charter or retained by the Services.

ACKNOWLEDGEMENT

Because JCAP is supporting this ADPA-sponsored conference, I want to use this opportunity to publicly acknowledge the outstanding contribution which has been made by the representatives of all of the Military Services through their participation in the work of the JCAP Demilitarization and Disposal Task Group -- and the very able leadership of John Byrd, who has just been appointed Director of the Defense Ammunition Center and School, in recognition of his outstanding record.

I acknowledge the contributions of the representatives of the environmental activities of the Military Services who have collaborated with the JCAP Demil and Disposal Task Group in preparing the analyses and evaluations of the EPA hazardous and solid waste regulation proposals on behalf of DOD. This effort has been acknowledged all the way up to, and including, the Office of the Secretary of Defense as an admirable job. You will hear from a number of these individuals during this conference.

MANAGEMENT CHALLENGE

There are many reasons why ammunition stocks are placed in the demilitarization account. For example:

(1) The weapons system for which the ammunition was produced and stocked has been eliminated from the inventory of US forces and our Allies.

(2) The stocks for one reason or another have reached a state where they are uneconomically repairable and require demilitarization and disposal.

(3) They have become unsafe, and because of the hazard, require demilitarization and disposal.

We currently have 168,000 short tons in the wholesale demil account. We are rapidly approaching an inventory of almost 200,000 short tons. We are exploring many options to reduce this inventory because it costs money to store, safeguard, and surveil these stocks -- not to mention the cost of record keeping and associated reporting. I will outline our approach -- the sessions that follow will address these in greater detail.

CONTROL OF DEMIL STOCK GROWTH

Because of more pressing priorities, the Demilitarization Disposal program is not being funded at the level which I feel is needed. My concern is that we are forecasting a net growth in the demil inventory at the rate of seven to ten thousand short tons per year for the foreseeable future. As a minimum, I feel we must zero out this growth and reduce demil stocks until we reach a normal working level which would be about 25% of what we currently have on hand or roughly 50,000 short tons.

PLANNING FOR DEMIL AND DISPOSAL

As a result of the moratorium on sea dump of munitions, JCAP initiated a series of initiatives in the field of demilitarization and disposal. JCAP proposed -- and the Joint Logistics Commanders (the Commanders of Army Materiel Development and Readiness Command -- Naval Material Command -- Air Force Systems Command -- and Air Force Logistics Command) approved a joint regulation requiring that planning for demil and disposal should be started during the design or redesign of conventional ammunition items. That joint regulation will be reviewed by Dr. Cornette today. Service representatives will describe implementation of the requirement.

The Single Manager interface with the Military R&D activities not only includes the demil plans for new or redesigned items, but the development of demil technology as well. We still lack technology to demil some types of munitions currently in demil stocks. In 1976 JCAP published a Demil Technology Handbook describing the technology gaps. The R&D community didn't take the hint. And so, when the 1979 up-date is completed I intend to press at the JCAP Coordinating Group meeting for a five year R&D program to develop the necessary technology so that I can do my job.

SMCA WHOLESALE/DEMIL DISPOSAL INITIATIVES

I would now like to turn to some of the alternatives we are pursuing to reduce demil stocks. I want to begin by saying there is no single alternative. There are many which we must orchestrate. We are using sophisticated cost, economic, and operational computerized modeling to optimize our management of the demil program. We believe that our program this year is giving us the best use of the limited dollars.

Recovery and conversion or reutilization must get greater emphasis. We are pursuing conversion of materials, such as converting CS stocks into a commercial chemical that would have a high payback potential.

We are preparing packages for sale by competitive bid to qualified domestic and foreign organizations for salvage and reclamation of materials. We expect to get this off the ground in FY80. The Navy has used this approach and we feel that it offers another alternative.

We are changing practices that put ammunition into the demil inventory that can be reused on the spot. Last summer we issued a policy requiring Quality Assurance specialists to inspect and authorize reissue of broken lots of small arms ammunition returned by units when they completed their

qualification firing to other units as long as it is in usable condition. This augments an existing policy of combining broken lots into consolidated lots by depots for reissue.

Recognizing that the costs of compliance at demil facilities is growing, we conducted a joint study with the Depot Systems Command last summer to determine the best way of optimizing the cost of compliance. The Army Materiel Development and Readiness Command approved the recommendations aimed at establishment of regional demil centers rather than continuing the historical practice of each storage facility doing its own demil. Instead of 15 demil facilities we will eventually have four or five. The first regional demil facility --- developed by the Navy --- is nearing completion at the Hawthorne Army Ammunition Plant in Nevada. When completed, it will be turned over to the Single Manager for operation. Other regional centers will follow as planning, design, and funding are completed. The study will be presented at this conference.

THIS IS OUR CHALLENGE

In summary my message to you is that we must face up to the fact that improving the quality of the environment is here to stay. Our job as managers and technical experts is to achieve workable solutions -- and by workable solutions, I mean solutions that meet the cost, economic, and operational needs of the organizations we represent.

The program that has been put together for this conference is an important constructive step in that direction.

I urge you all to get involved. What you have to say from the audience is just as important as what will be said from this platform. I wish you a successful meeting.

PUBLIC LAW 94-580

An Overview of the Resource Conservation and Recovery Act of 1976

Mr. John L. Byrd, Jr.
Director
Defense Ammunition Center and School
ATTN: SARAC-DO
Savanna, IL 61074
Phone No. 815-273-8511

Public Law 94-580, the Resource Conservation and Recovery Act of 1976, was passed by Congress on 21 October 1976 as an amendment to the Solid Waste Disposal Act. The Act (1) provides technical and financial assistance for the development of solid waste management plans and facilities for the environmentally sound disposal of discarded materials, and (2) regulates the management of hazardous waste. Congress passed Public Law 94-580 with the objective of promoting the protection of health and the environment while conserving valuable material and energy sources.

The term "solid waste" is defined as any garbage, refuse, sludge, or other discarded material resulting from industrial, commercial, mining, and agricultural operations, and from community activities. The exceptions are certain sources subject to the Federal Water Pollution Control Act or the Atomic Energy Act of 1954.

"Hazardous waste" on the other hand, is a solid waste, or combination of solid wastes, which, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may increase mortality or serious illness or pose a hazard to the environment.

The Resource Conservation and Recovery Act is to be primarily carried out on the state or local levels. Interstate agreements for the management of solid waste may be formed, however, these compacts require the approval

of the Administrator of the EPA and the Congress. This act does not authorize state, interstate, or local agencies to regulate activities or substances subject to other laws such as the Federal Water Pollution Control Act. Along the same line, the Act shall not be inconsistent with the goals and policies of other related acts.

Federal authority in the Resource Conservation and Recovery Act of 1976 is through the Office of Solid Waste, created as part of the EPA. Briefly, the purpose of the Office is to prescribe the guidelines and regulations applicable to this act, provide technical and financial assistance to state and local governments for solid waste management programs, and provide research and analyses related to resource recovery and conservation. Each regulation promulgated under the Act is to be reviewed, and where necessary, revised not less frequently than every three years.

Authorization for appropriation to carry out the provisions in the Resource Conservation and Recovery Act are:

FY77: 35 million dollars

FY78: 38 million dollars

FY79: 42 million dollars

Allocation of the funding includes not less than 20% to resource recovery and conservation panels which provide states with technical assistance, and not less than 30% for the purpose of carrying out Subtitle C (Hazardous Waste Management) of the Act. This does not include Section 3011 - Authorization of Assistance to States. The Office of Solid Waste is required to transmit to the Congress and the President an annual report concerning its past activities and future plans, and a summary to include any recommendations concerning solid waste.

Subtitle C, "Hazardous Waste Management," and Subtitle D, "State or Regional Solid Waste Plans," are being promulgated into regulation, most

of which have been published in the form of proposed rules. EPA has indicated that Subtitle C should be finalized in December 1979. Subtitle D regulations should also be finalized this year.

Commercialization of proven resource recovery technology is to be encouraged by the Secretary of Commerce. Material specification guidelines for recovered resources were to be published within two years of enactment. The commercial feasibility of resource recovery facilities may be evaluated and a data base established to assist persons in choosing such facilities.

Federal facilities are subject to the law and subsequent regulations governing solid waste disposal just like anybody else. The President, however, may exempt any solid waste management facility in the Executive Branch from compliance if he determines it is in the best interest of the country to do so. This does not apply in cases of financial shortfall, unless Congress failed to make available a requested appropriation. Federal procurement of recovered materials shall be instigated two years after enactment. Procurement agencies shall also manage or utilize those solid waste disposal facilities which maximize energy and resource recovery. Any executive agency which generates solid waste shall dispose of the solid waste in compliance with the law and the Code of Federal Regulations.

Public Law 94-580, Subtitle G, outlines the right of a citizen to sue. Briefly, any person may commence a civil action in district court on his own behalf in the following situations:

1. Against any person, including a government agency, who is in violation of any permit, standard, regulation, etc. covered under this act; or,

2. Against the Administrator of EPA for failure to perform any non-discretionary act or duty covered in the Act.

The actions may be brought in the district court where the violation occurred. The district court shall have jurisdiction to enforce regulations or to order EPA action. As an aside, the law provides that the employer cannot discriminate against an employee for taking such action. Normally, no court action can be taken within 60 days after the accusor has given notice to the proper authorities of the violation. EPA may, however, seek immediate cessation of a facility's activities if an "imminent and substantial endangerment to health or the environment" exists.

The Congress, through the Resource Conservation and Recovery Act of 1976, has tightened the lid on solid waste disposal in order to promote the protection of the environment and health, and to aid in the conservation and recovery of material and resources.

MANAGING A LOGISTICS COMMAND ENVIRONMENTAL PROGRAM

JAMES E. TRAGESSER - HQ DARCOM, DRCIS-A

PRESENTATION: 24 April 1979

General: Origin and growth of AMC/DARCOM's Environmental Program was discussed. Management organization at HQ DARCOM and structure throughout DARCOM as well as interfaces with other military and government organizations was also presented. Enactment of over 100 Federal Laws, Regulations and Guidelines greatly influenced the need to identify all pollution problems and corrective action throughout DARCOM. Intensive management of information at HQ DARCOM and Command Support is key to an effective environmental program. Heart of organization is the Pollution Abatement Operations Center (PAOC). It maintains current detailed data on all DARCOM installation environmental programs, problems and projects. Detailed data on the following subjects is maintained (much of it is computerized):

I. Non Complying Installations

II. Regulatory Proceedings

III. Litigation

IV. Operating Permits

V. Active EISs

VI. DARCOM Environmental Project Status (MCA, OMA, PAA & AIF)

VII. R&D Status and MM&T Status

VIII. Pollution Abatement Funding Summary

IX. New Replacement Engines, Emission Compliance Status

X. In Use Vehicle Emission Requirements

XI. International Logistics Customer Countries, Vehicle Emission Standards

XII. Fast Action Tracking ("Fat" Board)

XIII. Technical and Design Centers of Competence

XIV. Installation Surveys

Additionally, chief accomplishments and future emphasis were presented

Naval Environmental Protection Support Service (NEPSS) Efforts in Hazardous Materials Management

Karl E. Kneeling, P.E.
Navy Environmental Support Office (NESO)
Port Hueneme, CA 93043

ABSTRACT

This presentation describes the growing problems facing the Navy and other Department of Defense (DOD) components concerning the proper management of hazardous materials. The Navy's approach to identifying and solving its hazardous materials problems are described. In addition, information concerning Navy processes and operations using and disposing of hazardous materials is presented.

INTRODUCTION

EPA recently estimated that of the 35 million metric tons of hazardous wastes generated in the United States annually 90 percent is improperly handled and disposed. Many examples of inadequate management of hazardous materials receiving recent national attention include: the infamous Love Canal in New York; drinking water contaminated by chemical wastes in Tennessee; barrels of leaking wastes in Kentucky and Indiana; chemical tank car derailments in many parts of the country, overflowing acid disposal pits in California, miscarriages attributed to spraying of 2, 4, 5-T in Washington.

REGULATORY PRESSURES

Laws governing hazardous substances and resulting wastes were recently passed by Congress. The U. S. Environmental Protection Agency proposed in late December 1978 a series of hazardous waste regulations under the Resource Conservation and Recovery Act (RCRA). They will become effective in late 1979 or early 1980. These regulations will control the generation, processing, treatment, transportation, storage, and disposal of hazardous wastes. In effect, such wastes will be controlled tightly from the "cradle to the grave". In addition, the Toxic Substances Control Act will restrict usage of some chemical substances. Regulations resulting from the Clean Water Act will demand best management practices for preventing and controlling hazardous substance spills. These tougher regulations will probably take effect this year.

THE NAVY'S PERSPECTIVE

It is estimated that Navy ships and shore activities in the United States generate 19 million gallons of liquid hazardous waste

per year and 35 million pounds of hazardous waste solids. These wastes are generated at virtually every facility that operates industrial processes or health related services.

NAVY HAZARDOUS MATERIALS MANAGEMENT

To assure compliance with the many environmental regulations, which are placing strict controls on various aspects of hazardous materials, the Navy is launching a Hazardous Materials Management Program this fiscal year. The program includes, (1) the development of activity hazardous waste management plans, (2) hazardous material spill prevention control and countermeasures plans, (3) hazardous materials spill contingency plans; and, as the basis for the plans, (4) the conductance of hazardous materials management surveys by activities. As a means of providing uniformity throughout the Navy, the Naval Environmental Protection Support Service (NEPSS) has developed a Hazardous Materials Management Guide. The guide includes clear and concise procedures for conducting the surveys and descriptions of essential elements of each of the three resulting plans. It is hoped that all activities will complete their surveys by Feb 1980 and develop management plans by June 1980.

HANDLING AND DISPOSAL ASSISTANCE

Environmental studies and inquiries of Navy activities indicate that a real need exists at the activity level for assistance in identifying hazardous waste sources, quantifying hazardous wastes generation rates and providing disposal guidance. The NEPSS as technical adviser to Navy activities concerning hazardous waste problems provides the following assistance to all Navy and Marine Corps activities requiring assistance with hazardous waste problems:

- NEPSS Hazardous Waste Disposal Guide

This seven part document provides Navy activities concise methodologies and procedures for: characterizing, handling, processing, and disposing of hazardous wastes. The Guide addresses disposal of hazardous wastes from naval industrial, commercial, medical, and pest control operations.

The guide also provides names and addresses of disposal companies, disposal sites and has a directory of contacts within the Federal Government which can provide additional assistance for problem wastes. The underlying purpose of the guide is to help users gather all needed information prior to selecting or seeking disposal options, and provide information necessary for implementing these options at Navy activities.

- Consolidated Hazardous Item List (CHIL)

This Navy Supply Systems Command document provides disposal guidance for approximately 4,000 stock items in the Navy supply

system. The Navy Environmental Support Office (NESO) is responsible for periodically providing handling and disposal options in updating the CHIL to conform with current regulations and available technology.

- Pollution Solutions (PSs) and Information Bulletins (IBs)

These concise, one-to-two page documents provide specific detailed handling, disposal and compliance information to activities Navywide in a timely manner.

- Inquiries

All NEPSS/NESO components receive an ever-increasing number of inquiries concerning handling and disposal of hazardous wastes. The requests range from the need for specific disposal options to urgent requirements for an investigation of hazardous waste management deficiencies. Appropriate guidance and assistance is provided as quickly as possible.

CONCLUSION

In the Navy, as well as in other DOD agencies, we are only beginning to see the tip of the iceberg where hazardous wastes are concerned. As regulations are promulgated under various laws, more restrictions will be placed on the use, handling, and disposal of hazardous materials. This will place a heavy burden on field activities, operations, and processes using hazardous materials from which hazardous wastes are inevitably generated and ultimately require proper disposal. These problems must be identified in advance of the regulations so that solutions can be found in a rational, logical manner ensuring adequate safeguards for human health and the environment.

Pollution Monitoring of Demilitarization Processes

By Dan Burch

Materials Analysis and Technology Division
Weapons Quality Engineering Center
Naval Weapons Support Center
Crane, Indiana

Preface

The Weapons Quality Engineering Center (WQEC), Naval Weapons Support Center, Crane, IN has been tasked by NAVSEA, Demil/Disposal Program Manager to monitor demil/disposal processes. The purpose of which is to: 1) Determine operating efficiency of the processes and their pollution abatement equipment. 2) Determine if emissions or effluents conform to applicable pollution requirements. The demilitarization processes monitored include the prototype batch-box furnace at McAlester AAP, McAlester, OK; the rotary furnace at NWS Earle, NJ; and the explosive steamout facilities at NWS Yorktown, VA and NUWES Keyport, WA.

All of the source emission sampling and analyses were performed according to EPA prescribed methods. Particulates were sampled isokinetically and analyzed in accordance with Methods 1-5 Federal Register, Volume 42, No. 160, Part II, 18 August 1977. Sulfur dioxide and the oxides of nitrogen were sampled and analyzed by wet chemistry methods as described in Methods 6 and 7 respectively. The opacity was read by a certified visual emission reader.

Water quality analysis was performed in accordance with Standard Methods for Water and Wastewater Analysis, 14th Edition, 1976. The water samples were extracted and analyzed by either a liquid or gas chromatograph to determine the explosive concentration. Thin-layer chromatography was used to identify any degradation products of TNT.

Prototype Batch-Box Furnace

The batch-box furnace is a NAPEC designed unit consisting of an undergrate main burner and an afterburner. The furnace has a bucket type feed system which empties into an inclined feed chute with safety interlocked pneumatic loading gates. Fuzes, ignites, small pyro items, and ammunition up to .50 caliber can be disposed of in the furnace. The furnace is not to be considered as a high production facility. It is entended to provide a means of disposal for small groups of items near heavily populated areas opposed to the excessive cost of storage, packing and shipping to inland activities.

The batch-box furnace prototyped at McAlester AAP contains a wet scrubber system. The scrubber is a combination spray chamber/venturi/ marble bed unit capable of attaining a 21" WG pressure drop across the unit. This system was last tested in September 1976. The results show the furnace meets the particulate requirements for the NWS Seal Beach area which is considered to have the most stringent emission requirements

of any area receiving batch boxes. The South Coast Air Quality Management District considers the batch box a process oven for scrap metal reclamation. The furnace however, will not meet the opacity requirements until the feed rates are reduced considerably. Water quality data from the scrubber show that the heavy metals and low pH to be the major water pollutants. The Navy is in the process of selecting a bag house design to treat the emissions from the furnace. Plans are to install five additional batch-box furnaces at selected Navy coastal activities within the next two years.

Rotary Furnace

WQEC has performed source emission testing of the rotary furnace at NWS Earle, NJ. The furnace operation consists of: 1) A conveyor system for transporting the ordnance items to the furnace hopper, 2) an oil fired rotary furnace (APE 1236), 3) a conveyor system for removing the metal fragments remaining after demilitarization or to recycle the scrap, and 4) a pollution abatement system for removal of particulates from the stack emissions. The furnace is rated to handle approximately 30 grams of explosive charge per special section. Small caliber ammunition up to and including 20 MM cartridges, small fuzes and small pyro items can be run through the furnace.

The emission control equipment consists of a cyclone separator followed by a baghouse filter. The system is designed for a capacity of 4500 SCFM @ 4" H_2O pressure drop. The baghouse contains a bank of 144 cylindrical Nomex filters. The air cloth ratio is 1.95 SCFM/sq. ft. The bags are cleaned by a pulsed jet and the material is discharged through a hopper with a manual discharge valve.

Emission tests were performed in August 1977 and September 1978. Results of these tests show that the emission control equipment is very efficient for removal of the particulates from the rotary furnace. The emissions (lbs/hr) comply with the limitations established by the New Jersey Administrative Code for a process furnace for most items tested. The visible emissions were well below the 20% opacity requirement for all except some pyro smokes. An attempt was made to test some grenade smokes and decoy flares in the furnace at two rounds per minute. They produced smoke to the extent that the test run had to be discontinued because the baghouse pressure drop exceeded the recommended operating level. Several minor malfunctions occurred during the testing periods and a preventative maintenance program is being initiated to eliminate these.

Future tests are scheduled for new items which appear in the disposal inventory. A fixture was made to expose the explosive so that it will burn instead of detonate. If this fixture proves out, several additional items can be demilitarized by the furnace.

Yorktown Explosive Steamout

The explosive steamout process consists of three steam lance stations located over a heated holding tank. The lances are inserted in the ordnance item, and the molten explosive then flows into a heated holding

tank with an overflow for the process water. The explosive is allowed to flow into a vacuum kettle where the excess moisture is removed. The molten explosive is then fed onto a stainless steel belt which is water cooled to solidify the explosive composition. The solidified explosive is broken up as it comes off the belt and transferred to boxes, weighed, palletized, and stored for sale. Explosive ordnance items such as mines, depth charges, and large projectiles loaded with TNT or HBX can be demilitarized using this method.

The process water, scrubber water, and all clean-up water are treated by a water treatment system. This treatment system consists of a prefilter, a series of holding tanks and settling ditches, a diatomaceous earth filter, and a carbon absorption tower. Approximately 20 gallons per hour are treated by the system. An exhaust system is located over the steam lance stations to remove the steam from the room. This steam is treated by a scrubber which is vented onto the side of a hill. Exhaust hoods are also placed over the vacuum kettle and belt flaker. This air is treated by a wet spray scrubber and emitted through a small stack.

WQEC monitored the system as composition HBX-1 was being steamed out of MK 25 Underwater Mines. The results show that the steamout process produced a composition which met the reclaimed HBX specification requirements. The source emission results showed that there was very little particulate emitted during the drying and flaking operation. There was however, a trace of TNT found in the vapors emitted. TNT also escaped through the scrubber treating the steamout exhaust as TNT was detected on soil and leaf samples collected from the hillside. Analysis of the water samples show that there is a high explosive content in the samples before the carbon filter. The prefilters, settling ditches, and cooling tanks do not reduce the explosive content to a degree where the carbon can sufficiently treat the water without replenishing the charcoal frequently. No degradation products of TNT were determined in the final effluent.

Several changes have been incorporated in the system since the testing in March 1978. The process water is now diverted through settling ditches which are aerated to increase cooling and settling of the explosive. The scrubber treating the steamout exhaust has been modified so that the steam will be cooled to a greater extent, and the stack has been changed to eliminate ground contamination.

Keyport Explosive Steamout Process

The explosive steamout process provides NUWES Keyport a means for demilitarization of TNT loaded projectiles (8" and smaller). The system now located at Sub-Base Bangor consists of two steamout cabinets, a heated holding tank and a conveyor to hold the explosive cooling trays. WQEC monitored the system during steamout of TNT loaded 5" rocket warheads. Twelve warheads are placed in each cabinet for approximately 30 minutes. The explosive and contaminated water flow from the cabinets

into the heated holding tank. The molten explosive is then gravity fed into metal trays, allowed to soldify, removed from the trays, broken up, and packaged in cardboard boxes with plastic liners.

The process water is dipped from the holding tank and placed in metal containers. This water is allowed to cool and then filtered through a cloth filter into a metal drum. This water plus all clean-up water is incinerated in the liquid waste incinerator operated by Sub-Base Bangor. Approximately 240 gallons of TNT contaminated water is generated each day for disposal.

The pollution abatement equipment consists of two scrubbers (Ducon Centrifugal Wash Collectors). One scrubber (Scrubber A) treats the exhaust from the slot hood located at the end of the conveyor and vents from the steam cabinets. The other scrubber (Scrubber B) treats the exhaust over the holding tank and the slot hood at the beginning of the conveyor. The scrubber water is filtered through a 15 micron filter into a settling tank and recirculated back to the scrubber. The filters are changed several times daily and the recirculated water is changed monthly.

Analysis of the reclaimed explosive shows that the steamout system produces a salable grade TNT. The source emission results show that there is very little particulate emitted through the scrubbers. The particulate concentrations and mass rates are well below the standards specified by the Puget Sound Air Pollution Control Regulation. The only visual emission observed was water vapor which dissipated shortly after exiting the stack. There was some TNT vapor detected from the scrubber discharge. There are no specific standards for TNT vapor except the general rule regarding emission of air contaminates detrimental to person or property. The amount of TNT determined is not considered a significant quantity to produce any harmful effects to the surrounding environment.

Results of the water analysis show the TNT concentration is not significantly reduced by the cooling and filtering process. This concentration is not critical now however, as the water is being burned in the liquid waste incinerator. WQEC observed the incinerator during burning of the TNT contaminated water. No visual emissions were observed exiting from the burning chamber.

The entire system is scheduled to be moved to the Indian Island Annex. WQEC in collaboration with NAPEC recommends the following changes be incorporated in the new facility: 1) A belt flaker be installed to replace the present conveyo and cooling trays, 2) a holding tank for explosive and process water be modified to eliminate manual removal of the process water, 3) a full hood be placed over belt flaker to replace slot hoods, and 4) an alternate method for disposal of TNT contaminated water other than liquid incineration.

Any additional information can be obtained by contacting Commanding Officer, Naval Weapons Support Center (Code 3032, Dan Burch), Crane, IN 47522, phone autovon 482-1223, commercial (812) 854-1223.

INTERIM ARRADCOM INSTRUCTION PMA-101 DEMILITARIZATION/DISPOSAL CONVENTIONAL AMMUNITION/MATERIAL

PRESENTED BY

Samuel Davelman
Demilitarization Coordinator
USA Armament Materiel Readiness Command
Dover, NJ 07801

GUIDANCE FOR DEMILITARIZATION AND DISPOSAL REQUIREMENTS RELATING TO THE DESIGN OF NEW OR MODIFIED CONVENTIONAL AMMUNITION ITEMS IS CONTAINED IN A JOINT SERVICE REGULATION PUBLISHED 15 NOVEMBER 1977 AND IDENTIFIED BY THE ARMY AS DARCOM REG 75-2. THIS REGULATION STATES THAT ISSUE OF SUPPLEMENTS BY SUBORDINATE ELEMENTS IS PROHIBITED. THIS PROHIBITION HAS PREVENTED IMPLEMENTATION OF THE BASIC REGULATION BY THE ARMY. HOWEVER, A CHANGE IS BEING STAFFED THROUGH THE OTHER SERVICES TO PERMIT ISSUE OF SUPPLEMENTS.

VG 1 DRAFT INTERIM ARRADCOM INSTRUCTION PMA-101 HAS BEEN PREPARED AND WILL BECOME A SUPPLEMENT TO 75-2. I'LL IDENTIFY AND BRIEFLY DESCRIBE THE KEY POINTS OF THIS DOCUMENT.

VG 2 THE CONTENTS CONSIST OF PURPOSE, SCOPE, OBJECTIVES, TERMS POLICY, RESPONSIBILITIES, PROCEDURES, REFERENCES, AND AN APPENDIX GIVING THE DEMIL/DISPOSAL PLAN FORMAT.

VG 3 PURPOSE OF THIS INSTRUCTION IS TO ASSIGN RESPONSIBILITY, PROMULGATE POLICY, PRESCRIBE PROCEDURES FOR THE DEMIL AND DISPOSAL OF CONVENTIONAL AMMUNITION, AND TO IMPLEMENT DARCOM REG 75-2.

VG 4 THIS INSTRUCTION APPLIES TO DARCOM DEVELOPMENT AND READINESS COMMANDS, PROJECT AND PRODUCT MANAGERS, AND OTHER DARCOM AGENCIES AUTHORIZED TO DEVELOP OR MODIFY AMMUNITION.

VG 5 IT'S OBJECTIVES ARE TO ASSURE THAT DEMIL AND DISPOSAL CONSIDERATIONS ARE AN INTEGRAL PART OF THE DECISION MAKING PROCESS RELATING TO THE PLANNING, DESIGN, DEVELOPMENT, PRODUCTION AND FINAL ACCEPTANCE OF ALL NEW OR MODIFIED ITEMS OF CONVENTIONAL AMMUNITION.

VG 6 FOR CLARIFICATION, DEFINITIONS ARE INCLUDED FOR AMMUNITION, DEMILITARIZATION, DISPOSAL, AND DISPOSABILITY BY ACCEPTABLE MEANS.

VG 7 ESTABLISHED POLICY REQUIRES THAT DEMIL AND DISPOSAL BY ACCEPTABLE MEANS BE A MANDATORY CONSIDERATION IN THE DESIGN CONCEPT. METHODS EMPLOYED SHALL CONFORM WITH APPLICABLE ENVIRONMENTAL REQUIREMENTS. DISASSEMBLY, RECOVERY AND SALVAGE OF COMPONENTS FOR SALE, REUSE OR CONVERSION TO OTHER APPLICATIONS WILL BE GIVEN FULL CONSIDERATION.

VG 8 THE COMMANDER, US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND, IS RESPONSIBLE FOR IMPLEMENTATION AND COORDINATION THROUGHOUT DARCOM OF DARCOM REG 75-2. THE ARRADCOM PROGRAM MANAGEMENT SUPPORT OFFICE WILL SERVE AS STAFF COORDINATOR AND FOCAL POINT WITHIN DARCOM. IT IS RESPONSIBLE FOR EXCHANGE OF INFORMATION WITH AIR FORCE AND NAVY COUNTERPARTS.

VG 9 EACH DARCOM DEVELOPER SHALL:

TASK THE APPLICABLE READINESS COMMAND ELEMENT/ MAINTENANCE ENGINEERING AGENCY, HEREAFTER IDENTIFIED AS THE DEMIL/DISPOSAL OPERATOR, TO PERFORM THIS FUNCTION. THIS AUTHORIZES THE READINESS COMMAND TO REPRESENT THE DEVELOPMENT COMMAND AS ITS REPRESENTATIVE.

PROVIDE TECH DATA AND HARDWARE WHEN REQUIRED BY THE DEMIL/DISPOSAL OPERATOR AND ASSIST WITH PREPARATION OF PLANS, TEST REPORTS AND HAZARD ANALYSIS.

STAFF AND OBTAIN FINAL APPROVAL OF PLANS DEVELOPED BY THE READINESS COMMAND.

VG 10 THE DARCOM DEVELOPER SHALL ENSURE THAT:

ITEM DEVELOPMENT OR MODIFICATION PLANS INCLUDE PROVISIONS FOR DEMIL AND DISPOSAL WHICH WILL NOT HAVE AN ADVERSE EFFECT ON THE ITEM PERFORMANCE AND RELIABILITY.

PLANS HAVE BEEN REVIEWED AND APPROVED BY THE SAFETY OFFICE PRIOR TO OT II AND THAT ACCEPTABLE METHODS OR PROCESSES HAVE BEEN TESTED AND EVALUATED PRIOR TO THE INVENTORY PRODUCTION DECISION.

VG 11 THE DEMIL/DISPOSAL OPERATOR SHALL:

PARTICIPATE IN EARLY DESIGN PHASES TO ASSURE THAT DEMIL AND DISPOSAL IS CONSIDERED AND ADOPTED WHEN FEASIBLE.

OBTAIN TECH DATA AND HARDWARE NEEDED TO PLAN, DEVELOP, TEST, AND EVALUATE AN ACCEPTABLE METHOD OR PROCESS THAT WILL CONFORM TO APPLICABLE ENVIRONMENTAL REQUIREMENTS.

IDENTIFY AND PROVIDE FOR DESIGN OF NEW TOOLS AND EQUIPMENT, PERFORM HAZARD ANALYSIS, INSURE SAFETY, AND PREPARE FINAL REPORT WITH FINDINGS AND CONCLUSIONS.

VG 12 THE PLAN FORMAT SHALL INCLUDE: SAFETY SUMMARY, ENVIRONMENTAL IMPACT STATEMENT, SCOPE OF THE PLAN, REFERENCES, ALTERNATIVES, PROCEDURES, AND REQUIRED TOOLS AND EQUIPMENT.

MEDICAL ASPECTS OF HAZARDOUS WASTE DISPOSAL

by COL J. W. Thiessen, MC*

Discussion of health aspects, i.e., the evaluation of measures to protect the public health, may provide a "backdrop" against which discussion on technical aspects may be viewed. Health protection is at the beginning and at the end of all disposal discussions and efforts; at the beginning, because an assessment of risks to health sets the goals of the disposal efforts, i.e., to keep exposures of the public below levels that may be considered hazardous; at the end, because the final test of the adequacy of our efforts is the absence of any health impact, or, in different terms, the lowering of the occurrence of health impairments now ascribed to less than optimal disposal practices.

Three subject areas will be discussed, two rather generally, and the third in somewhat more detail: the extent of the problem, specifically with respect to ground pollution; the health effects that have been related to toxic materials in the environment; and the problems related to carcinogen disposal.

Extent of the Problem

The number of hazardous waste disposal sites with potentially significant health risks is not exactly known, but the estimates appear to rise rapidly. In January of this year, EPA estimated the number at 838, but in March 1979, the estimate had increased to "between 1240 and 2027." Funds necessary to alleviate some of the more urgent problems were estimated at between 3-1/2 and 6 billion dollars, and permanent cleanup was estimated to involve expenditures of up to 45 billion dollars. I think it is fair to say that, more than likely, the estimates will increase, and one has to agree with the recently retired Chairman of the House Subcommittee on Oversight and Investigations, Rep. John Moss, when he called the problem of ground pollution "the sleeping giant of the decade." As far as the public at large is concerned, it was not until "Love Canal" that the dangers of ground pollution were widely recognized. In the military environment, Rocky Mountain Arsenal may serve as the prime example.

By now, the number of horror pictures showing "sanitary" landfills in different states of disarray has become staggering. In all these pictures, one object stands out as the symbol, the toy of the sleeping giant: the 55-gallon drum. Other sources of ground pollution are, of course, equally obvious. All have as their major threat the contamination of ground-water supplies, a threat the more serious because approximately half of the population in this country depends on ground water as their main source of drinking water. Compared to air pollution and pollution of surface waters, ground-water pollution may turn out to be the most hazardous from a public health point of view. It certainly is one of the most complicated ones from an abatement viewpoint.

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* Director, Occupational and Environmental Health, US Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD 21010, Telephone (301) 671-2304.

Health Effects

The effects produced by exposure to toxic agents are usually subdivided into acute or short-term, and chronic or long-term effects. The former clearly demonstrate a threshold, i.e., a minimum dose below which no manifest impairments are observed. The long-term effects are those appearing late during continuous exposure to low-level pollutants, or years after a relatively acute exposure.

It is important to distinguish two entirely different forms of chronic effects, known as stochastic and nonstochastic effects. The latter are those in which the severity of the effect is related to the dose, whereas in the former, the frequency of the effect in the exposed population is related to the dose (or the total, time-integrated, exposure). Some examples will illustrate the different kinds of effects just mentioned.

An example of an acute effect from air pollution is the occurrence of a severe skin ailment ("chloracne") in the inhabitants of Seveso, Italy, shortly after they were exposed to tetrachlorodibenzoparadioxin (TCDD) released during a runaway reaction in a plant producing trichlorophenol (July 1976). TCDD is also known to cause other acute effects in animal experimentation, but these were not seen in Seveso, one demonstration of the large differences in species' sensitivity that are characteristic for all toxic substance effects.

Chronic, nonstochastic effects occur when there is a slow buildup of a toxic material in the body, e.g., of lead in children ingesting chips of lead-containing paints, a not uncommon phenomenon known as "pica." There is a very clearcut relationship between length and intensity of the exposure on the one hand, and the time of occurrence and severity of the symptoms of lead intoxication on the other hand. It is now also known that exposures to low enough lead levels in the environment will not result in a measurable effect in any of those exposed, i.e., that there exists a threshold. This phenomenon is used to derive a "safe", no-observable-effect level ("NOEL") from which acceptable Pb levels in water, air, etc., can be derived in a straightforward fashion.

In case no adequate human data are available, animal data are used to derive such levels, but safety factors are applied to insure that an unusually high sensitivity in the human species will not cause the threshold dose to be lowered after the fact. It is usual to apply safety factors or "uncertainty factors" (EPA) of 100 when valid and complete animal data are available, and of 1000 when only scanty results, order-of-magnitude data, are available from animal experiments.

As to the stochastic chronic effects, those are more fully discussed in the following. Cancers are the prime example of such effects; genetic effects, i.e., the induction of mutations and their expression in the offspring of exposed individuals, are another.

Carcinogens

Carcinogenic agents are substances (or forms of radiant energy) able to induce cancer in a portion of the individuals exposed to them. At high enough doses, they usually also produce acute and nonstochastic chronic effects (with a threshold, and a proportional relationship between dose and severity of the effect), but below doses that produce neither of these effects, cancer induction is still demonstrable in large enough populations. It is to be clearly understood that exposure to carcinogens is related to a frequency, and not to severity of the effect (e.g., of the cancer produced). Also, the cancers induced are rarely of a type unknown or rare (such as mesothelioma following asbestos exposure, hemangiosarcoma of the liver in vinyl chloride exposure). Consequently, at low doses, the small number of cancers induced in a population may be immeasurable because of the large number of "spontaneous" cancers in that population (25 percent of all persons will develop some form of cancer, and 17 percent will die from it).

In order to be cautious, the assumption of no-threshold is applied, together with the assumption of linearity (i.e., direct proportionality) between dose and effect. Neither one of these assumptions has been proven, and the second one is, at best, only correct at relatively low doses. It appears extremely unlikely that a real cancer risk is connected with doses that come very close to zero, e.g., because of the fact (established for many carcinogens) that the induction period (latency) between exposure and cancer appearance increases with increasing dose, so that it is quite possible that the expected latency period at low doses exceeds the remaining lifespan, in other words, that a practical or apparent threshold exists.

Be that as it may, for the calculation of "allowable" carcinogen levels in water, the assumptions are used to extrapolate from animal or human data at relatively high doses down to the expected effect at the low doses considered. Unlike the situation with noncarcinogens, it is now impossible to determine a no-effect level, and one has to postulate a risk level that is "acceptable." EPA, in its proposed water quality criteria (Federal Register, 15 March 1979, p. 15926, et seq.) establishes "target risk levels" of 10^{-7}, 10^{-6}, and 10^{-5} and calculates pollutant concentrations that, in the case of lifetime consumption of this water, result in the indicated risks of cancer death.

To view these levels in the proper perspective, the National Academy of Sciences, in a report published in 1972, estimated that background radiation is probably responsible for 1 percent of the cancer incidence in the United States. This can be calculated to mean that the lifetime cancer death from this environmental (but unavoidable) source is of the order of $2 \cdot 10^{-3}$. Most daily activities that are considered risky, but are done anyway because of necessity or desirability (transportation, sports activities, etc.), carry a risk of 10^{-4} (or worse) per year, i.e., a lifetime risk of between 10^{-3} and 10^{-2} (or worse). Clearly, to set too stringent limitations on risk acceptability might result in resource allocations that may do more harm than good, as there are very real limitations on the resources available. For this reason, a recent editorial in Science (26 January 1979) suggests a pragmatic "de minimis" approach to risks, such that risks of about 10^{-5} per year or less should be ignored, at least for the time being.

It needs no argument that the extent or our efforts in hazardous waste disposal is closely related to what society eventually, and it is to be hoped soon, will consider an acceptable risk.

S U M M A R Y
O F
CHEMICAL, NON-TOXIC DISPOSAL SYSTEM

THOMAS E. SHOOK
CHIEF, DEVELOPMENT & TECHNOLOGY DIVISION
PINE BLUFF ARSENAL, ARKANSAS

F O R

AMERICAN DEFENSE PREPAREDNESS ASSOCIATION

A Pollution Abatement/Incinerator Facility is described ($16.374 million) which will go on-stream in FY 79 to allow Pine Bluff Arsenal to meet both mobilization and normal workloads associated with Production and Disposal operations.

The Facility will consist of (a) collection and treatment of liquid pyrotechnic waste and subsequent flocculation of suspended solids into a lagoon; (b) incineration of other waste not suitable for treatment in (a); and (c) collection of WP waste with evaporation, spray-drying, holding and/or ozonation or treatment in (a) and (b) where required. Scrubber water in (b) will go to (a) for treatment. The lagoons in (a) are expected to hold all sludge generated for several years. An MCA-83 will provide ultimate disposal facilities and a hazardous landfill where required to meet new EPA regulations in Hazardous Waste. Exhibit I describes the capability of the Incinerator Facility with Exhibit II being a diagram of the facility.

The report contains information on Plant Design Criteria (Part I); Pilot Fluid Bed Incinerator Equipment (Part II); Current EPA Criteria for Operation of the Plant (Part III); New Pollution Criteria expected to be applied to these operations in the future (Part IV); Pilot Incinerator Studies for Red Smoke (Part V), which are representative of the approach for study of any chemical to be incinerated; and Summary Information (Part VI) on costs and future testing likely to be required for the several media in out-years as EPA research continues.

A DESCOM/ARRCOM Study (September 1978) has assigned a 12-year workload to Pine Bluff Arsenal to demil non-lethal chemical items. This work would start in FY 1981 at a level of 6,000 tons/year at a cost of 17 cents/pound.

Additional information on the program may be obtained from Thomas E. Shook, Environmental Coordinator, Pine Bluff Arsenal, Pine Bluff, Arkansas 71611, Autovon 966-2636, Commercial Telephone: 501-534-4600, ext. 2636/2433.

EXHIBIT I

The Pollution Abatement Complex will be capable of handling the following load.

INCINERATOR COMPLEX - LINE ITEM 52:

ROTARY KILN FURNACE:

CHEMICAL WASTE (WHOLE ITEM)	108-360 LBS/HR
METAL	56-112 LBS/HR
GRAINS TNT	600 (MAX)
FEED RATE (ITEMS)	700/HR (MAX)

CHAIN CONVEYOR FURNACE:

CHEMICAL WASTE	22.5 LBS/HR
METAL	1,473 LBS/HR
ASH	4.5 LBS/HR

FLUID BED INCINERATOR:

CHEMICAL WASTE	800-4000 LBS/HR

GRENADE TEST CHAMBER:

GRENADES/CANISTERS	2 PER MINUTE

COLLECTION & TREATMENT - LINE ITEM 41 (MAX CAPACITY):

VOLUME WATER (TREATED)	800,000 GAL/DAY
SCRUBBER WATER, INCINERATOR (RECYCLE)	300,000 GAL/DAY
VOLUME WATER (DISCHARGED)	500,000 GAL/DAY
SOLIDS (IN)	5% BY WEIGHT
SOLIDS (OUT)	0.04% BY WEIGHT

WP AREA WASTE - LINE ITEM 37:

VOLUME PHOSSY WATER TREATED	21,000 GAL/DAY
VOLUME AIR SCRUBBED	60,000 ACFM
EVAPORATOR FEED RATE	816 GAL/HR
EVAPORATOR CONCENTRATE - VOLUME	18 GAL/HR
EVAPORATOR CONCENTRATE - WT. SOLIDS	30 LBS/HR

INCINERATOR COMPLEX SITE PLAN

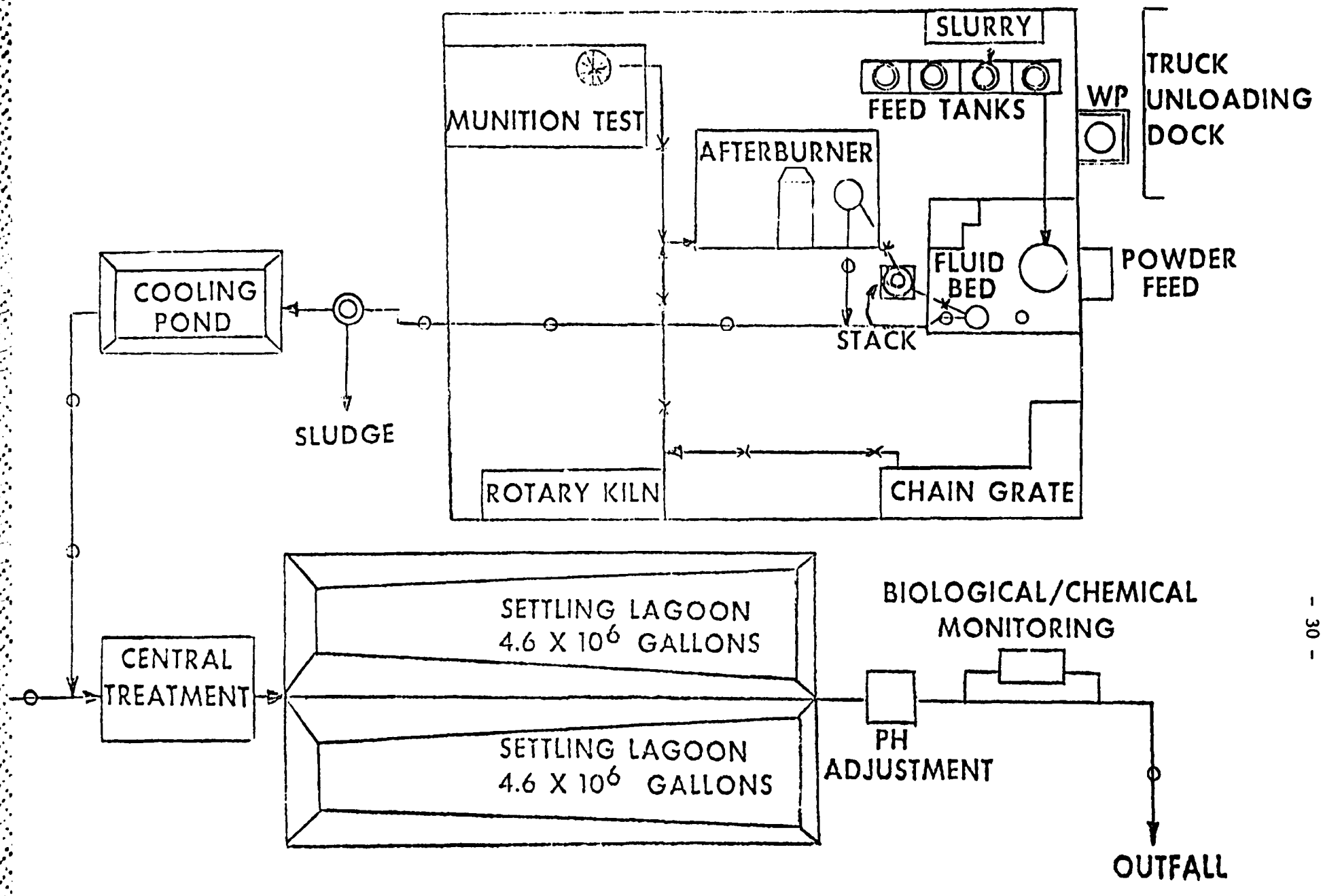

EXHIBIT II

DESIGN AND IMPLEMENTATION OF MONITORING PROCESSES DURING DEMILITARIZATION

(Summary of a paper presented to the SECOND DEMILITARIZATION AND DISPOSAL TECHNOLOGY CONFERENCE, April 24-26, 1979, Salt Lake City, Utah, by Gregory A. Jungclaus, Ph.D., Research Chemist, Analytical and Environmental Chemistry Section, Battelle Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201, 614/424-5635.)

There are several important reasons for designing and implementing a monitoring program at a demilitarization site. Most important is that there is now much evidence that exposure to hazardous chemicals can cause deleterious health effects. Thus, the first goal of monitoring is to protect the health of the demilitarization personnel. Next, it is important to prevent insult to the environment due to possible effects of the chemical. Monitoring is also important to provide a check on the effectiveness of the actual demilitarization process such as incineration, chemical neutralization, or any other process.

A monitoring program includes many different aspects including the following:

- Compounds to be Monitored
- Analytical Methods Development
- Sensitivity Requirements
- Types of Monitors
  - Existing Instrumentation
  - Develop New Instrumentation
- When to Monitor
- Location of Monitors
- Sampling Strategy
  - Number of Samples
  - Media to be Sampled

The agent to be demilitarized is often not the only compound which needs to be monitored. In some cases, the compound may be degraded to other compounds which are also hazardous.

Often there is not an existing analytical method for the compound to be monitored. In this case, extensive analytical methods development is required prior to actual demilitarization.

The sensitivity requirements for monitoring depend on the quantity of the compound which can cause deleterious health effects. It is desirable that unmasked workers not be exposed to concentrations of agent that exceed the no-effects dose level, where dose is the product of the agent concentration and time. Of course, the sensitivity requirements ultimately depend on the success of developing analytical methods for the agent. Typically, methods for levels of compounds down to 1-10 parts per billion (ppb) can be developed.

The types of monitors available range from simple field kits containing reactive organic compounds which yield a semi-quantifiable color reaction on contact (by spraying or mixing) with the compound being monitored to complex analyses for which the sample must be returned to a laboratory and analyzed with sophisticated instrumentation. If actual monitoring instruments such as air monitors are available, sites must be selected which afford the maximum amount of information possible. If samples must be taken at the demilitarization site and returned to the laboratory for work-up and analysis, the sampling locations should be selected to provide maximum information on personnel and environmental insults in as short a time as possible.

The most desirable type of monitor is, of course, a real time monitor which continuously samples and generates a quantitative result every few minutes. Considerable research and development is now being spent in this area, although the number of successful instruments is limited. A nerve agent real time monitor is available at the Chemical Agent Munitions Disposal System (CAMDS) at Tooele Army Depot, which is based on use of a colorimetric enzyme reaction. Other real time monitors based on gas chromatographic and electrochemical enzyme detection are being developed for various applications.

Not only is it important to monitor during the demilitarization process, but in order to judge the impact of a demilitarization process, some monitoring should be performed prior to demilitarization in order to determine what compounds may be present from previous demilitarization or manufacturing operations. In addition, the monitoring should continue after the demilitarization has ceased in order to evaluate the success of the demilitarization upon completion.

Another important consideration is what media should be monitored. The most important is generally the air since this is the most direct route to human and environmental exposure. However, the compounds of interest must also be monitored in several other matrices. For example, exposure can occur on surfaces, and thus these surfaces must be able to be quantitatively sampled and analyzed. Also, allowable wastewater and drinking water standards may be

established for the compounds of interest, requiring various aqueous matrices be sampled and analyzed. Other matrices that may need to be monitored include soil, sediment, and body fluids.

The remainder of this paper will deal with some of Battelle's experience in designing and implementing monitoring processes for demilitarization and installation restoration. The first example is the demilitarization of Herbicide Orange on Johnston Island. Battelle set up a series of analytical laboratories in several buildings on Johnston Island which had previously been used as rocket fuel testing laboratories. The monitoring program involved collecting and analyzing air samples on Chromosorb adsorbent traps, water samples, drum rinse samples, impinger samples, and surface samples. The samples were extracted with organic solvents and analyzed at the ppb level using gas chromatography utilizing electron capture detection. For 2 weeks prior to departure to Johnston Island, the analytical techniques for the compounds in Herbicide Orange were thoroughly evaluated and improved at the Battelle Laboratories so that further development work would not be required prior to demilitarization at Johnston Island. Another monitor that was employed to a small extent at Johnston Island was tomato plants. Since tomato plants are very susceptible to herbicides, they proved useful in determining if Agent Orange was present in the air.

Battelle was also involved in an Installation Restoration monitoring program at Frankfort Arsenal. In this case, we needed to determine the identity and quantity of munitions remaining from a munitions manufacturing operation. Much of the work involved collection of samples (water, soil, sump) at the site and returning the samples to Battelle for liquid chromatographic and thin-layer chromatographic analyses. The compounds which were analyzed included PETN, NG, TNT, RDX, and TNR. Another technique that was developed for this program was direct application of a chemical indicator spray reagent to a surface to determine if contamination was present. Several reagents were developed which formed a distinctly colored complex following reaction with a certain compound or class of compounds. The approximate quantity of the munition contamination was estimated by comparison of the color intensity to standard photographs. In cases where the surfaces did not contrast well with the indicator dye, swab samples were collected, and the indicator spray reagent was applied to the swab. If the color development was still masked using swabs, a second swab was eluted with acetone and analyzed by thin-layer chromatography.

Battelle is currently involved in a large program concerned with demilitarization of the incapacitating agent BZ. The activities involved in this program include the following phases:

BZ Monitoring Program

Phase 1	Integration of process engineers and analytical chemists to define problems.
Phase 2	Analytical method development for compounds of interest
Phase 3	Laboratory experimentation to test effectiveness of proposed demilitarization processes and analytical support to evaluate results
Phase 4	Determine feasibility of various monitoring instrumentation
Phase 5	Develop monitoring strategy
Phase 6	Develop monitoring instrumentation
Phase 7	Pilot plant shakedown of monitoring instrumentation
Phase 8	Implementation of demilitarization employing monitoring instrumentation and analytical support

In Phase 1 of the program incineration was chosen as the demilitarization process of choice with chemical neutralization as a backup. In Phase 2, analytical method development started during which we needed to develop methods not only for BZ, but also for potential BZ breakdown products such as 3-quinuclidinol and benzophenone. We started with simple matrices such as distilled water and clean surfaces and progressed to more complex matrices such as neutralization brines and incineration effluents. Gas chromatography with flame ionization or electron capture detection was suitable for samples from some matrices, but gas chromatographic mass spectrometry (GC/MS) was necessary for quantitation of BZ in complex incineration effluents, and to identify other BZ breakdown products.

During the laboratory analytical method development, we also studied the feasibility of developing specific monitoring instrumentation, including real time monitors, dosimeters, and area monitors to supplement the data resulting from collection and analysis of other samples within the demilitarization plant. Simultaneously we developed a use strategy for the monitoring instrumentation which was primarily concerned with the specific performance goals for each item of monitoring equipment and also where the instruments should be located. Phase 5 represents our current progress in designing and implementing a monitoring program for BZ. The next phase entails actual development of the monitoring instrumentation ranging from evaluating the various components in the laboratory to assembly and testing of a breadboard model. Once the instruments are developed and laboratory tested, final shakedown will be performed at the demilitarization pilot plant. The instruments will then be used in conjunction with other sampling and analysis support techniques at the plant used for the anticipated successful demilitarization of BZ.

ENERGY ASPECTS OF MUNITIONS DEMILITARIZATION/DISPOSAL

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The requirement for the conservation of energy, especially fossil fuels, is becoming more evident as one notices the prices at the gas pumps. All federal agencies, including DOD, have been directed by the President to reduce energy consumption. All the easy and obvious steps such as lowering thermostats, elimination of non-essential vehicle trips, applying insulation to buildings, etc. are easily attainable goals. Implementing energy conservation in the munition demilitarization missions requires the more difficult tasks of developing technologies that will allow the recovery of energy from the disposal processes. Disposal is defined by Webster as "giving away, transferring, getting rid of and selling." Disposal suggests more than throwing away; it implies resource recovery as well. Explosives and much of its packing materials are combustibles. The incineration of these materials will provide heat energy to be used as is or that can be recovered in the form of steam which in turn can be used directly as process steam or for facility heating, or for electrical power generation.

Over the next ten years, the US Army will have to dispose of 581 thousand tons of obsolete and deteriorated ammunition. Currently 73,100 tons of non-small arms munitions are stored and awaiting disposal. This amount will increase by 50,800 tons per year over the next ten years.

In the past, unserviceable munitions have been disposed of by either open burning or open detonation. This practice is being stopped due to EPA regulations and the potential for energy recovery from these items.

The recoverable explosives fillers and propellent in these items weigh over 96 thousand tons and have an energy content equivalent to 6.9 million gallons of fuel oil.

The combustible packing material from this obsolete ammunition weighs almost 31 thousand tons and has an energy content equivalent to 3.47 million gallons of fuel oil.

The packing material, propellents and explosives fillers from these items have a fuel value equivalent to 10.4 million gallons of fuel oil. When equated to the price of fuel oil these munitions have an economic value of over 5 million dollars. Increasingly stringent environmental regulations have generated the need for more sophisticated disposal methods than were previously employed. These more refined disposal methods have also opened the door that allows the use of alternate fuel sources.

There are two facilities currently being planned or constructed that will use non-fossil fuels as a supplement to its fuel requirement in disposing of outdated munitions. One is the Large Item Flashing Chamber for the Western Area Demil Facility at Hawthorne, Nevada and the other is the Fluidized Bed Incineration Module of the DARCOM Depot Disposal System to be located at Red River Army Depot. Similar follow-on facilities are to be built at the Savanna Army Depot Activity and Tooele Army Depot. The Western Area Demil Facility (WADF) at Hawthorne, Nevada plans to use recovered propellent powders for decontaminating metal parts and casings. This process is to be performed in the Large Item Flashing Chamber Facility at the WADF. The washed out casings are placed on a mine car, and reclaimed propellent is poured over and in them. After the propellent has been added, the car and its contents are moved into a chamber where the propellent is ignited.

This burning propellent supplies the heat needed to consume any explosive residues on the metal parts.

The ammunition disposal facility being planned for construction at Red River Army Depot will burn recovered propellents and explosives fillers in a fluidized bed incinerator.

Waste heat from the incinerator will be used to preheat incoming air, decontaminate metal parts in a flashing chamber, and potentially generate steam to be used for other processes in the disposal facility.

As environmental and economic pressures increase, the fuel source available to the Army in obsolete and deteriorated ammunition becomes more significant. The efforts being made at Red River and Hawthorne are steps in using recovered explosives for fuel in an environmentally acceptable manner.

The cost of munition disposal facilities and operations that are within acceptable environmental ethics are increased 300% or more over past disposal methods. To offset some of this cost through the recovery of energy is a continuous prime effort within DOD. Even though the average energy value of explosives and propellents is approximately one-third that of fuel oil, for each 10 pounds of explosives destroyed, a gallon of fuel oil is saved.

These energy recovery and conservation methods are certainly not the easy and obvious attainable goals. Hazardous wastes (including unserviceable explosives and munitions) are an especially critical problem; however, the depot system and single manager activities have set an example in the demilitarization/disposal of munitions by developing environmentally adequate disposal methods that conserves/recovers the fast dwindling energy supplies.

USING THE CAVIJET® PROCESS TO REMOVE EXPLOSIVES FROM ARMY MUNITIONS*

by

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At the first Demil Symposium (Hawthorne, Nevada, April 1976), a test and evaluation program was described wherein the HYDRONAUTICS' CAVIJET® cavitating water jet process** was used to remove propellants and liners from Navy missile motor casings (1). Since that time we have undertaken an analogous program, but with the objective of developing a system, using the CAVIJET technology, to remove explosives from various Army munitions such as the 105-mm, 155-mm, and 8-inch warheads.

During the first phase of this effort, just completed, basic safety questions were answered in a series of CAVIJET nozzle cutting trials on TNT and Composition B test specimens, plus 105-mm shells loaded with Composition B. Over 200 tests were run on explosive specimens, 4 by 4 by 1 in., with no detonations, at pressures ranging from 2,000 to 10,000 psi. Since the 10,000 psi pressure is more than twice the anticipated 3,000 to 4,000 psi to be used in a CAVIJET cavitating jet system for explosive removal, these safety evaluations provided the desired basic answer to how the cavitation phenomenon would interact with these explosives. Some of the conclusions from the hazards analyses of these results were: (a) a probability of safety of 97.4 percent at a 95 percent confidence level was calculated for Composition B if using the CAVIJET process with a pump pressure of 3,000 psi; (b) the testing of TNT yielded a 95.2 percent probability of safety at a 95 percent confidence level for the use of the CAVIJET process at 3,000 psi. A total of 11 runs were made on the two Composition B loaded 105-mm shells, with exposures as long as three minutes and at pressures up to 10,000 psi. Again, no detonations occurred, which tended to reconfirm the safety of the CAVIJET process for this application.

Tests with an inert filler material, modified to stimulate the erosion response of Composition B, were then conducted to establish the role of various system operating parameters, such

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**U. S. Patent Nos. 3,528,704; 3,713,699; and 3,807,632.

as pump pressure, rate of feed of the cutting head into the shell, and speed of rotation of the shell, on the rate of explosive removal by CAVIJET nozzles. The results from these tests indicate that CAVIJET is capable, at the lower pump pressure, of cleaning out these munitions faster than existing high-pressure, noncavitating water jet systems. The following table shows a comparison of an existing high pressure washout facility at the Iowa Army Ammunition Plant (2) with the anticipated required parameters for a CAVIJET cavitating jet system:

Parameter	High Pressure Washout	CAVIJET Process
Nozzles	Two @ 0.06 in. dia.	Three @ 0.10 to 0.15 in. dia.
Pressure	10,000 psi	3,000 to 4,000 psi.
Flow	22 gpm	54 gpm
Power	128 hp	126 hp
Time to clean a 155-mm shell	2.43 mins	1.82 mins
Energy/155-mm shell	3.9 kw-hr	2.9 kw-hr

In comparison to existing hot water washout procedures (3), it is anticipated that the CAVIJET process will require less than one-twentieth the energy per round, and by using cold water will minimize the amount of explosive which goes into solution—thus simplifying the water treatment process (4).

The second phase of this program will involve modification of the high pressure washout facility at the Iowa Army Ammunition Plant to demonstrate the CAVIJET technology for demil of both 155-mm and 8-inch warheads (see Figure 1). In addition to continuing the capability study of the CAVIJET process, this pilot effort will also examine explosive drying procedures, and the feasibility of filtering, cooling, and recirculating the water through the system.

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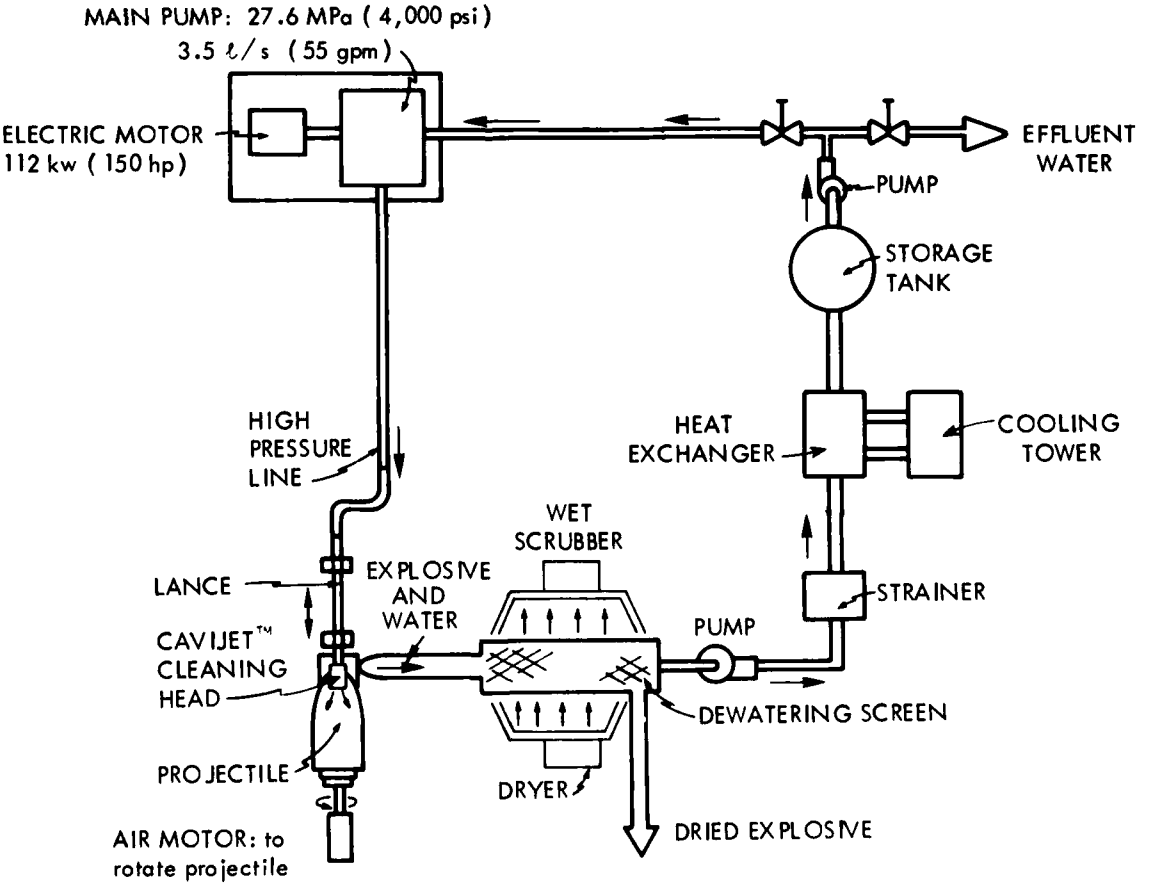

Figure 1 - Pilot CAVIJET® cavitating jet facility for explosive removal.

THE UTILIZATION OF A LARGE-CAPACITY SAW IN ORDNANCE SECTIONING AND DEMILITARIZATION ACTIVITIES

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With the current pressures of environmental protection and cost effectiveness, increasing efforts are being devoted to find ways to reclaim rather than destroy disposable ammunition. Routine large-scale open burning and detonation of obsolete and unserviceable ammunition is no longer permitted by federal and, in many cases, state regulations. In addition, the expenditure of funds to destroy items which can be reclaimed is no longer justified. Finally, due to the escalating cost of energy and materials, reclamation often becomes the desired goal of demilitarization of ammunition.

Therefore, the use of sawing in reclamation work is being investigated by the Naval Weapons Center. In this investigation the Center has looked into the feasibility of utilizing the unique capabilities of a large, production-type sawing machine at Hawthorne Army Ammunition Plant (HWAAP) for quality-control and reclamation operations. The data obtained in the investigation is transmitted to the sponsoring organization, the Naval Sea Systems Command (SEA 06J23), which is responsible for the economic analysis and cost effectiveness of all the demilitarization work it funds.

The sawing machine at HWAAP is a Do-All Zephyr Model ZW-3632-HB Contour Band Sawing Machine. It is a band-type saw, has an automatic feed, and has a 32-inch throat capacity and 72-inch travel. The saw table is 8 by 4 feet, and the table height is approximately 30-1/2 inches. The overall machine height is 90 inches. All saw operations can be remotely controlled. With funding provided by the Naval Weapons Center, the motor and controls of the saw have been explosion-proofed.

In accordance with OP-5 (Ref. 1) and AR 385-100 (Ref. 2), when processing energetic materials, the saw blade is limited to a velocity of 210 linear ft/min, in contrast to a velocity of 4,000 ft/min for sawing a soft metal like aluminum. The feed table functions at 1-1/2 in/min for energetic materials and a 5 in/min for aluminum. The saw blade is purchased from the manufacturer under the trade name "High-Speed." The blade material appears to be adequate for most uses. The blade has six teeth per inch and is 23 feet long.

Preliminary work indicates the saw can section all melt-cast explosives, most high-density pressed explosives, and most double-base propellants. The saw cannot properly section loose-packed pyrotechnic materials and certain composite propellants which have elastomeric binders.

For cutting metal, the cutting fluid is a water-oil emulsion of 10 parts water per one part oil (Ref. 3). (In general, all propellants can be cut dry, although water may be used as a coolant with double-base propellants.) The cutting fluid recirculated, and the solid residues are trapped and collected. The saw will not function unless a minimum volume of cutting fluid is flowing.

In normal ordnance production sawing operations, seven people are required -- three ordnance workers, two ordnance operators, one fireman, and one truck driver.

This sawing machine can be used advantageously in quality control of large-diameter explosive or propellant loadings and in demilitarization operations. Very often such defects as the migration or settling out of components in a grain go undetected by radiographic analysis, because of the small density gradients involved. Through sectioning, such imperfections can be precisely identified.

For example, nitroglycerine migration is a problem in double-base propellant charges. This factor often determines the shelf life of the grain. Therefore, a good surveillance program for a large number of grains in storage would involve periodic sectioning of selected samples.

In demilitarization, larger ordnance items can be sawed up into smaller pieces that can be disposed of in a nonpolluting manner. Where reclamation is the goal, sawing can be combined with subsequent washout or machining.

The saw at HWAAP has sectioned such items as a cement-loaded Mk 25 underwater mine 20 inches in diameter by 60 inches long. This mine is typical of large-diameter ordnance items which can be handled by the saw. In demilitarization operations, the aluminum tail sections of 120-millimeter HEAT-T M469 projectiles have been sawed off before removal of the fuzing and washout of the warheads. A holding fixture was designed whereby 12 tail sections were sawed off per single pass of the feed table through the sawing zone. The elapsed time for a sawing cycle of 12 tail sections was 4-1/2 minutes. By stacking three rows of projectiles, 15 to a row, as many as 45 tail sections can be sawed off during a single cycle.

It is anticipated that large-diameter propellant grains such as the Talos Mk 11 Mod 1 will be sectioned, and the double-base material range tested. If its effectiveness as a demolition agent can be shown, an alternative to burning or demolition of these grains will have been found.

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THE DOD SURPLUS PERSONAL PROPERTY DISPOSAL PROGRAM

THE DEFENSE LOGISTICS AGENCY ADMINISTERS THE DOD SURPLUS PERSONAL PROPERTY DISPOSAL PROGRAM. THIS MISSION IS ACCOMPLISHED THROUGH THE DEFENSE PROPERTY DISPOSAL SERVICE IN BATTLE CREEK, MICHIGAN, AND 5 REGIONAL OFFICES (3 in CONUS, 1 IN HAWAII, 1 IN GERMANY). THERE ARE 153 DISPOSAL ACTIVITIES. OVER 4200 PEOPLE ARE EMPLOYED IN THE DISPOSAL PROGRAM.

EXCESS PROPERTY IS SCREENED FOR USE THROUGHOUT THE DOD AND FEDERAL CIVIL AGENCIES. PROPERTY NOT UTILIZED IS OFFERED FOR DONATION TO ACTIVITIES OF SPECIAL INTEREST TO DOD, PUBLIC AIRPORTS, AND TO THE STATES. PROPERTY NOT UTILIZED OR DONATED IS SOLD. SALES ARE CONDUCTED THROUGH SEALED BID, AUCTION, SPOT BID, NEGOTIATED, AND RETAIL METHODS, SEALED BID AND SPOT BID ARE THE MOST WIDELY USED.

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FURTHER INFORMATION ON THE DOD SURPLUS PROPERTY DISPOSAL PROGRAM CAN BE OBTAINED FROM THE DEFENSE LOGISTICS AGENCY, ATTN: DLA-SMP (PAUL PRUTZMAN), CAMERON STATION, ALEXANDRIA, VIRGINIA 22314.

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REUSE OF RECLAIMED NAVAL EXPLOSIVES

by

L. R. ROTHSTEIN AND W. McBRIDE

THE SECOND DEMILITARIZATION AND DISPOSAL TECHNOLOGY CONFERENCE

SALT LAKE CITY, UTAH

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REUSE OF RECLAIMED NAVAL EXPLOSIVES

by

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The purpose of this paper is to define the United States Navy's position on the reclamation and reuse of Naval explosives.

Apparently, conflicting answers have been given in the past to the question, "does the Navy reload reclaimed explosives into fleet ordnance?". The reason for the confusion results both from how long ago the question was asked and by whom the answer was given.

Historical explanations will not be dwelt on here. Rather, the intent is to clarify very briefly why there was any confusion to begin with and then to address the much more pertinent questions, namely, "should the Navy, or any of the armed services, use reclaimed explosives? If so, which explosives? If not, why not?".

Conflicting answers to the original question developed from the following facts:

- first, Naval munitions explosives loads, i.e. TNT, Comp B, Comp A-3, Explosive D and the aluminized HBX's all have steamed, drilled and washed out of Naval munitions in both past and recent times.

- secondly, these demiled explosives have followed one of the four paths; some have been disposed of by burning, some have been sold commercially for further reclamation or processing by the buyer, some have been loaded into testing devices - as opposed to fleet munitions - and, finally, some have been reloaded into fleet ordnance items.

Why then confusion or contradictions? The answer is two-fold. The first half of the answer is that until the establishment of a single command, the Naval Sea Systems Command (formerly Naval Ordnance Systems Command) no, one, absolute authority existed in the Navy that was knowledgeable of the total disposition details of reclaimed explosives.

Thus, field stations with broader authority and options than now exist, could and did make disposition of reclaimed explosives by one or all of the methods just described. This usually was done with the advice and/or consent of then existing BUORD or BUWEPS personnel. However, no central authority existed and whether or not a given field

station carried out one or more of the disposition procedures, would not necessarily be known to one responsible office. Certainly, the different field stations would be aware of their respective detailed demil operations by chance at best.

Our best information, gathered for this meeting, is that only TNT was both reclaimed and reloaded - possibly more than once - into Naval mines or torpedoes. Some Comp B riser scrap was recycled and indications are that some reclaimed aluminized explosives may have been loaded into test devices that had short retention lives. Thus, several million pounds of reclaimed TNT was used for the atomic simulation fleet tests in the Pacific known as operation Sailor Hat. All others were either burned or packaged and sold.

The second half of the answer is also an outgrowth of the past lack of a single authority. For example, OP-5, Vol. I, Rev. 4, par. 7-5.4e, categorically calls for disposal of any reclaimed explosives. What is not categorical is the definition of disposal and whether or not it includes resale!

Therefore, in any case, depending upon the time frame and the individual queried; it is clear that different responses to the question could be given and it is quite possible that sales disposition could have been effected in the past without the approval or even knowledge of the current responsible NAVSEA personnel.

So much for history. What is important is that the Navy does have a central Sea Systems Command authority and a comprehensive policy that hopefully covers all contingencies.

In brief, the policy as applicable to the four options mentioned earlier are:

- For destruction disposition by burning etc. it is necessary only that the demil procedure generate material that can be safely handled and transported to a disposal site by approved procedures and that the total cycle time be reasonably short by reducing interim storage to an absolute minimum.

- For generating flake or granular material that would not necessarily be of specification grade, it is necessary to have supporting documentation that delineates the material's explosive class and safe-handling, packaging and storage characteristics before release for commercial sale.

- For reloading into explosive devices, in addition to the information required above, it is necessary to provide shelf-life and potential hazards data concerning any non-specification materials loaded into confining containers. Also approved operating or loading procedures must be generated for such non-standard explosive devices as for standard fleet weaponry.

- For reloading into fleet ordnance, all explosives must be both sampled, analyzed and certified to meeting relevant specifications. Reconstitution is permissable and in the few cases where minor waivers to extant specifications are thought desirable they must be justified satisfactorily to the same cognizant NAVSEA decision making authorities.

The rationale behind this policy should be clear. Our MIL-SPECS were developed for a reason. The reason was to produce not only effective but safe and long-lived ordnance. The explosive literature is replete with warnings describing the serious consequences that can arise from the auto-catalytic decomposition of explosives of substandard quality.

Let us conclude with a few examples:

- Longwell warns of the auto-catalytic decomposition of nitrocellulose (used in D-2 waxes and, therefore, all HBX type explosives) and, quote, "margins of safety dictated by engineering judgements ..... and the magnitude of the cost of being wrong."

- Joyner speaks of the catalytic role of iron oxides (rust) causing as much as a 10 fold acceleration rate in TNT - based systems decomposition as well as the fact that virgin TNT and hot melt (asphalt) is already 1 percent decomposed in only 3 hours after being held at 120°C.

- The 1966 explosion of the KNSF workshop in Muiden, Holland occurred in a TNT reclamation plant. The melt tank was an agitated, 3-foot diameter steam jacketed vessel with side and bottom drain cocks. Details of the explosion, since it occurred on an unattended shift are not known. However, subsequent simulations of what may have gone into the reclamation pot as floor sweepings such as ammonium nitrate, cardboard, potassium nitrate, iron showed that at the same temperature, heat generation was 20 to 35 times higher than for pure TNT!

Other examples could be given but the message is already clear. To assure that Naval ordnance meet not only its effectivity mission but its transportability and storability mission as well, it is mandatory that, not only must explosive purity specifications be met, but that they be proved truly adequate. The same is true, of course, of any reworked, bulk explosive. It is certain that all the services will agree to this basic philosophy.

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ELEANOR L. PUNOTTY	NAVMAG, LUALUALEI, HAWAII
DR. LOUIS L. PYTLEWSKI	FRANKLIN RESEARCH CENTER
KEN O. RANGE	PROG MGR NAV AEDA DEMIL
HOWARD G. REED	DEFENSE PROPERTY DISPOSAL SERV, OGDEN, UTAH
JEROME RICHARDSON	US NAVY (NAPEC), CRANE, INDIANA
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WALLACE E. SILVER	NAVAL WEAPONS CENTER
PETE J. SINCLAIR	US ARMY ARMAMENT COMMAND
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HAROLD D. SMITH	SANDIA LABORATORIES
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T. J. SULLIVAN	NSWC, INDIAN HEAD, MARYLAND
WILLIAM A. SWEETLAND, JR.	WEAPON STATION, EARLE
ROBERT L. TARNO	US NAVY
CURTIS F. THAMES	DESCOM, CHAMBERSBURG, PENNSYLVANIA
LTC J. W. THIESSEN	USAEHA
ANN B. THOMPSON	DISPOSAL PROG NAVAL SEA SYST
IVAN TOMINACK	NAVAL ORDNANCE STATION
JAMES E. TRAGESSER	ARRACOM
MICHAEL A. TRAVISANO	NAVAL WEAPONS STATION, EARLE
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